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ABSTRACT

Whether large-scale or small farms dominate, a county's farm structure is influenced not only by changes within farming but also by key factors such as nonfarm economic activity, geography, and population growth. Large-farm counties where agriculture dominates the economy are concentrated in the Plains, Midwest, and Mississippi Delta. Small-farm counties, with larger, more diversified economic bases, are concentrated in the Southeast. However, more than 50% of the nation's counties are unclassified, presenting local planners with special challenges in charting development either toward agriculture or to a more diversified economic base. Unclassified counties that tend to have small-farm characteristics are found mostly in New England and scattered parts of the Southeast and West. Those tending to have large-farm characteristics are usually located adjacent to large-farm counties. This report identifies which counties are dominated by small- or large-farm agriculture as well as a large group, termed unclassified, which could go either way; provides models to differentiate county types; maps and describes developing subregions; and presents implications for rural America. (Author/NEC)

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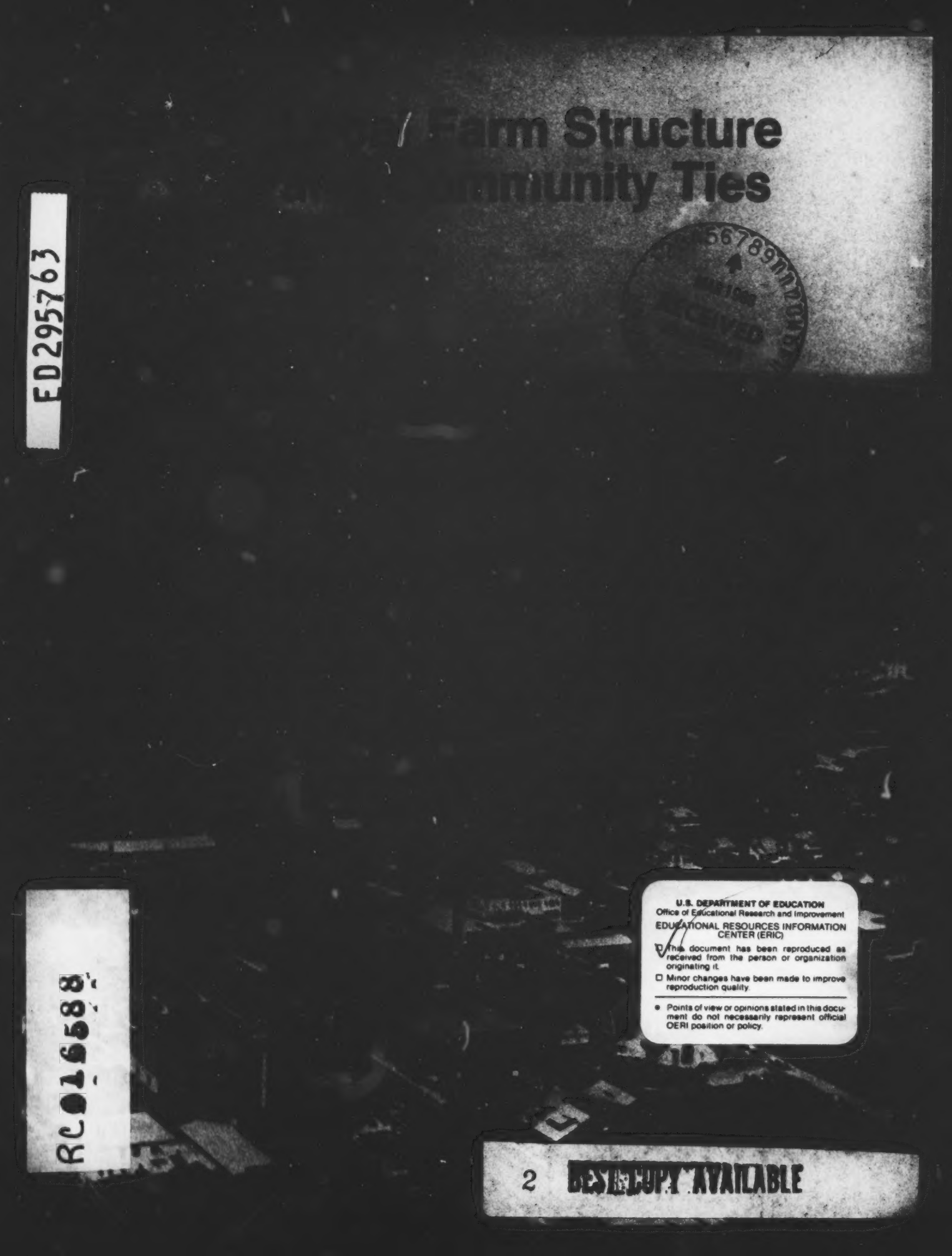

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Abstract

A county's farm structure—whether large-scale or small farms dominate—is influenced not only by changes within farming but also by key factors such as nonfarm economic activity, geography, and population growth. This report identifies which counties are dominated by small- or large-farm agriculture as well as a large group, termed unclassified, which could go either way. Large-farm counties where agriculture dominates the economy are concentrated in the Plains, Midwest, and Mississippi Delta. Small-farm counties, with larger, more diversified economic bases, are concentrated in the Southeast. However, more than 50 percent of the U.S. counties are unclassified, presenting local planners special challenges in charting development either toward agriculture or to a more diversified economic base. Unclassified counties that tend to have small-farm characteristics are found mostly in New England and scattered parts of the Southeast and West. Those tending to have large-farm characteristics are usually located adjacent to large-farm counties.

Keywords: Farm structure, rural development, large farms, small farms.

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Summary

A county's farm structure is influenced not only by changes within farming but also by key factors such as nonfarm economic activity, geography, and population growth. This report identifies which counties are dominated by small- or large-farm agriculture as well as a large group, termed unclassified, which could go either way. Rural development practitioners and county officials can use this information to examine their jurisdictions and decide whether to diversify their economy or to strengthen but restructure their farm sector, possibly going to larger farms.

Large- and small-farm counties are typed according to the portion of farms with 1982 gross sales of less than $40,000. Large-farm counties are those with the lowest percentage, while small-farm counties are those with the highest percentage. Agriculture dominates the economy of large-farm counties. Such counties have small employment bases and few nonfarm job opportunities and are concentrated in the Plains, Midwest, and Mississippi Delta. Their leaders will decide whether they can effectively compete in global agricultural markets. Small-farm counties have larger, more diversified economic bases and are concentrated in the Southeast. Their leaders will focus on finding a niche for farming in a basically nonfarm economy. Unclassified counties, which make up 50 percent of all counties in the continental United States, fall in the middle range.

Since 1980, State and local governments have been asked to play a stronger role in guiding their own destinies. The more importance of farming in the local economy, the more critical it is that local leaders understand the factors that influence the farm sector's structure. Leaders in large-farm counties thus face stronger challenges in charting a course for their local economies. Some local leaders will be evaluating whether their farm sector has enough comparative advantage to emerge as a winner among international competitors, while others will want to follow a strategy of building a diversified local economy. Diversifying, however, will likely also change the organization of the local farming sector.

Leaders of unclassified counties, or those that fall in the middle range, stand to learn the most from this study's findings because it is in these jurisdictions that controlled change can best be carried out. This report gives guidance on which way the farming sectors in such counties are headed. Unclassified counties with characteristics that portend small-farm structure are found mostly in New England and scattered parts of the Southeast and West. Those that are moving more toward large-farm structure are concentrated in areas adjacent to large-farm counties.

Based on analytic findings, the authors provide brief scenarios of how all three county groups—large-farm, unclassified, and small-farm—will respond to impending changes in U.S. agriculture.

Local Farm Structure and Community Ties

Thomas A. Carlin and Bernal L. Green*

Introduction

Americans realize that sustained financial problems in the farm sector influence whole communities and regions whose economies are based on agriculture. The strong interdependence could translate into rapid restructuring of the farm sector and farm-dependent communities. Concerned groups throughout the country's farm regions are consequently exploring ways to cope with the restructuring process.[1]

This report suggests that the structure of a local farm sector is closely related to the basic economic, human capital, and geographic attributes of the local community. We identify the areas of the country dominated by small-farm and large-farm agriculture and examine the factors historically associated with the two types.

Knowing about these factors will help local officials to interpret changes in their local farm sector influenced by national trends. The information can be valuable to them as they weigh options that could alter the course of development in their communities.

Background

Our investigation into the question of local farm structure draws primarily on two models often cited in rural social science literature. The first concerns the emerging structure of the U.S. food and fiber system [*17, 18*].[2] Our attention to the food and fiber system focuses on its emerging dualistic nature. Proponents of the first model argue that the farm sector is moving toward a structure in which a few large producers grow most of the U.S. food and fiber and a large number of small farms produce relatively little. The second model centers on community development.

Community Link

Our attention to community development focuses on the emerging economic and social diversity of nonmetropolitan (nonmetro) communities and the changing role of farming in most local communities [*3*]. Both themes, change in the food and fiber system and community development, dominate current public discussion in the rural social sciences. Often, but not always, the two models are explored separately. We believe that important relationships exist between the structure of agriculture and other economic activity in the local community. Our purpose is to investigate those relationships.

Changes in Farming

The U.S. farm sector has had a persistent problem of longrun excess production capacity since at least World War II [*5*]. As wartime price supports were lifted, it became evident that the farm labor force needed to be pared if farming was to become viable without extensive Government support. In postwar America, infusion of laborsaving technology to the farm had a dramatic effect. Labor, in fact, has been leaving agriculture since the early 1950's. Visible signs of this 1950's phenomenon included rapid declines in the farm population, net outmigration from rural areas, absolute declines in population and employment in many rural communities, and the near disappearance of southern sharecropper agriculture.

During the mid-1970's, economic conditions and weather combined to bring a unique set of circumstances to the farm sector. Product prices increased, farm incomes rose, and real interest rates were low. And, with the expectations that U.S. agriculture would reach new heights, land prices were bid up. The farm sector experienced a new period of prosperity.

Conditions sharply reversed themselves in the early 1980's, leading to a farm financial crisis. The value of farm capital, primarily land, was too high in view of

* The authors are agricultural economists with the Agriculture and Rural Economy Division, Economic Research Service, U.S. Department of Agriculture.

[1] A notable example is the conference "Coping with Change: Rural America in Transition," sponsored by the Foundation for Future Choices and the Hubert H. Humphrey Institute, at the University of Minnesota, December 2-3, 1986.

[2] Italicized numbers in parentheses refer to items cited in References at the end of this report.

income growth prospects and higher real interest rates. The value of the production plant dropped, primarily through falling land prices. Declining land prices coupled with low commodity prices have created cash flow problems for some farmers. Unable to obtain credit, some are being forced to liquidate part or all of their farming operation. Perhaps 10–15 percent of the Nation's farmers who were in business before 1980 will cease operating before the financial adjustment is complete [*10, 23*]. Political debates focus on whether this phenomenon is a slight divergence from past trends or a massive shakeout of the sector. Considerable interest has arisen over what the farm sector and farm-dependent communities will look like when the crisis has run its course [*10, 21, 22*].

One outcome of the combined effect of technology, public policy, and other factors throughout the post-World War II period is the movement towards a dual farm structure: a large number of small farming establishments which produce relatively little of total U.S. food and fiber and a few large establishments which provide a major portion of total output [*15, 24*]. There has been considerable periodic concern about the disappearing middle, what many consider to be the traditional family farm [*6*].

Communities in the western Corn Belt and Northern Plains have been hurt by the recent farm financial situation because farming dominates the economies of these communities [*22*]. There has been a general feeling that farming communities in areas dominated by large-scale agriculture are less viable than those dominated by small- and family-sized farms [*16*]. Research has provided mixed answers about how nonfarm industrial development affects the local farm sector. Some studies suggest that development of this kind results in farms shifting to less labor-intensive commodities as the opportunity cost of labor increases. If an area is dominated by smaller scale marginal farms, then nonfarm industrial development may complement the farming sector by providing jobs for underemployed farmers and family members.

Changes in Rural America

The economic environment of postwar rural America has changed considerably [*3*]. Rural areas became more economically diverse. During the 1950's and early 1960's, the decline in the number of farmers exceeded any growth in nonfarm employment in most rural communities [*4*]. This massive exit from farming resulted in a precipitous decline in rural population as millions of people migrated to urban centers to find work. By the late 1960's, the farm population had shrunk so much that growth in nonfarm employment outpaced further declines in farming. This uptick in the nonfarm economy resulted in net employment and population growth primarily in southern rural areas. Such growth more recently took place in the rural Southwest.

Manufacturing and services such as those associated with retirement and recreation activities began to dominate the economy of some communities during the postwar period. A key feature of this transformation was the drop in the number of areas dependent on farming as a major economic activity [*3, 11*]. For example, the number of counties with 20 percent or more of earned income from farming fell sharply from about 2,000 in the early 1950's to 700 or fewer by the late 1970's.

Farmers faced with adjustment problems now have a different set of options than might have been available in the 1950's and 1960's. There is a reduced need, for example, to migrate to urban centers because of more plentiful off-farm job opportunities nearby. However, there is a definite geographic aspect to how farming's structure is changing. Rural development experts recognize that the quantity and quality of natural and human resources vary considerably across the country.

Shifts in Local Planning Approaches

For 7 years, the Nation has followed a public policy course of "New Federalism" in which State and local governments play a stronger role in charting their future. This policy has important implications for how local leaders approach problems. Community leaders, especially in areas where farming still dominates the local economy, are interested in and need to know what might happen to their local farm sector. They are raising vital questions. In view of what is known about factors that influence the local farm structure, what is the future for farming in the community? How will farming's future affect local decisions about economic development and local public infrastructure?

Researchers are interested in answering those questions in a systematic way. By analyzing local farm structure, identifying variables associated with local farm structure, and interpreting those variables in light of current conditions, they are discovering vital new information. This information will be useful to local government policymakers as they consider options that might alter the course of development in their communities.

Today's situation merits attention for two key reasons. First, the pace and extent of the restructuring process in the domestic farm sector is not necessarily subject to the control of American policymakers. Global developments, such as emergence of foreign competitors in the world farm product market, constitute unstable forces that will share in reshaping American agriculture.

Second, more population declines in the U.S. farm belt can cause precipitous declines in vital public- and private-sector goods and services. For example, continuing loss of residents in the Northern Great Plains will result in downtown business failures. Thus, the sustained crisis in farming is causing public concern about what the farm sector and farm-dependent communities will look like once the crisis ends [*10, 21, 22*].

Assessing Local Attributes that Drive Farm Structure Change

Our research examines forces impinging on local farm structure. We define counties by the relative proportion of large-scale farms. That information is then used to suggest prospective trends in the structure of the local farming sector and implications for the community.

Research Objectives

We first formulate a conceptual model that identifies the major factors believed to be influencing the structure of U.S. agriculture. We measure farm structure by farm product sales. The importance of the model lies in providing a rationale for choosing the independent variables to be used in the analysis.

We define counties in which farming is decidedly small scale and large scale. We then use discriminant analysis to select from a wide group of variables only those which are best able to identify counties characterized by small-scale and large-scale farming. Finally, we use this information to suggest the general direction in which counties in the middle of the continuum are moving. It is in these counties that local leaders may best be able to influence the direction of the local farming sector.

Conceptual Framework

Babb developed a conceptual approach to identifying factors that affect farm structure to provide decisionmakers "a basis for making informed choice among alternative (farm) structures" [*1*]. Babb's model contained most of the critical elements relevant to our inquiry. However, he did not attempt to quantify and test his hypothesized relationships between farm structure and characteristics of farm operators, the farm sector, rural communities, Government, and rural people.

Our objective was to quantify and test the relationships between farm structure and the local farming sector, community economic structure, local geography, local human capital, and the public sector, starting with Babb's conceptual approach. The conceptual model guided our efforts in selecting appropriate data.

We based our research on the premise that the national farm sector is influenced by international and national policies and events, called macro events, as well as the sum of local events across the United States.[3]

The effects of macro events on the farming sector are well known and have been chronicled [*23*]. Macro events may influence local community structure, but the linkages are complex. Unraveling these relationships is beyond the scope of our analysis. We essentially treat them as given or fixed.

Our interest is with the other sets of factors representing the local community. We maintain that these variables play an important role in influencing local farm structure, and, that depending on the particular combination present at any one time, their role may overshadow the effects of macro events. If we are correct, State and local officials need to think about solutions to the farm crisis not in terms of national agricultural policy but rather in terms of broader development policy. Our groups of local attributes include: farming sector, community economic structure, geography, human capital, and population size and the public sector.[4]

Local Farming Sector. Components of the local farming sector include enterprise combinations (specialization in one or more types of crops or livestock), level of technology adopted by local producers, land characteristics (the extent to which the land is productive and adaptable to crop and/or livestock production), level of capital investment in the local farming plant, and returns to land, labor, and other capital. The factors are distributed differently across the United States, and they influence the way the local farming sector evolves over time. As we will later show, large-scale commercial farming has developed in different parts of the United States than has small-scale farming.

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[3] These ideas can be expressed mathematically as:

(1) National farm structure = f[(macro events) + $\sum_{i=1}^{n}$ (local farm structure$_i$)]

where:

(2) Macro events = g(national public policy, national economic conditions, international economic conditions)

(3) Local farm structure$_i$ = h(macro events, FS$_i$, ES$_i$, G$_i$, HC$_i$, PS$_i$)

where:

FS$_i$ is attributes of the local farming sector, ES$_i$ is the local community economic structure, G$_i$ is local geography, HC$_i$ is local human capital, PS$_i$ is population size and the public sector, and i is the local community.

[4] Local is defined, for this report, as county.

Community Economic Structure. A local community's nonfarm economic activities, such as durable goods manufacturing, compete with farming because they provide alternative uses of labor, land, and other capital. In economic theory, these nonfarm economic activities establish the opportunity cost for farm labor and capital. If the opportunity cost of labor, for example, is high compared with what can be earned with local farm resources, farmers might reduce the size of their operations and work off-farm. Alternative scenarios can be hypothesized, but we contend that community economic structure has a major influence on local farm structure.

Geography. Our notion of geography encompasses a wide variety of variables including topography, climate, settlement patterns, and the availability of water. For example, irrigating from surface and ground water sources has allowed large-scale farming to become viable, especially in semiarid parts of the country such as California and the Texas High Plains. The large scale was dictated by the need to spread high fixed costs for irrigation equipment over a large number of acres. In the United States, land irrigated with ground water reached 32 million acres in 1977, but ground water levels are in chronic decline for 15 million of these acres [*19*]. Drops in ground water levels mean rising energy costs to lift water from deep aquifers. Thus, even if other costs remain constant, farm structure will be affected by escalating pumping costs and, in some instances, by economic exhaustion of the water supply. An example of areas facing exhaustion of the water supply are the central and southern Great Plains, which are depleting the Ogallala Aquifer. Costs may increase rapidly in semiarid areas that contain metropolitan centers competing with farms for scarce water.

Human Capital. The study of human capital gained prominence during the 1950's when conventional explanations for growth of gross national product fell short of the mark. Schultz, in a pioneering article in 1956, reported that greater use of conventional inputs accounted for little of the increased output in farm and nonfarm sectors [*18*]. This mystery caused him to emphasize the improved quality of people as productive agents and the emergence of the productive arts. Martin explained that human capital results from investments in formal and informal education, health, and aesthetic and recreational experiences. Human capital is an integral part of the individual, and is therefore as mobile as the individual [*14*].

Two important aspects of human capital come into play. First, humans have a dual role. They are a factor or means of production and they are the end consumers of the product. The need for large capital investments in farming coupled with technological revolution led many to agree that farming now requires relatively high levels of education. Thus, the 1960's signaled the beginning of a trend toward more farmers and farm managers who have 4 years or more of college education [*7*]. The second aspect is that mobility or migration, which is governed mainly by wage and earnings differences among industries, continues to characterize the U.S. farm sector. When farm regions are close to large nonfarm labor markets, mobility is enhanced. Productivity gains in the farm sector have been so great that millions of farmers and farm managers have been released to seek nonfarm employment. There were, for example, 6.3 million farms in 1940, compared with 2.3 million in 1985 [*24*]. In the same period, off-farm earnings rose. For instance, off-farm income was negligible in 1940, but by the 1980's it ranged from 54–72 percent of income of farm operators [*24*].

Population Size and the Public Sector. Population size is an important indicator of what size private and public service sectors a community can maintain. At the local level, population increases translate into new patterns of demand for land formerly used for agricultural purposes and open space. Growth was especially strong in urban fringe areas and rural areas in the 1970's. Population decreases, on the other hand, can signal difficulty in maintaining tax revenues to support current service levels [*2, 12*].

Communities depend on revenues from taxes and other sources to fund vital public services such as schools, roads, fire protection, and waste disposal. A recent Senate study points to eroded local tax bases in midwestern farm counties resulting from recent declines in farmland values [*22*]. Crumbling tax bases, combined with higher tax delinquency rates and reduced Federal and State aid, spell hard times for local governments trying to manage local services. At the other extreme, fast-growing communities may be faced with rising demands for public services, pushing up landownership costs. Population change and public-sector actions consequently can be expected to cause important adjustments in farm structure.

The Federal Government distributes funds to State and local areas. These funds are for a variety of purposes and take the form of direct transfers (cash), grants, and loans to local governments, businesses, and individuals. For example, the Federal Government distributed $28.1 billion in 1980 to businesses and local governments for economic development [*9*]. Economic development programs include revenue sharing, small business loans and grants, and loans for constructing water and sewer facilities. It distributed another $16 billion in 1980 for

agriculture. The monies went toward Commodity Credit Corporation loans for commodities, direct Government farm program payments, farm ownership and operating loans (direct and insured), and emergency loans. As the farm financial crises deepened after 1980, Federal expenditures for agriculture grew rapidly. These funds influence both the local farming sector and the community.

The five components of the conceptual model of local farm structure we described raise some key questions which we address:

- Which areas of the country are dominated by small-farm and large-farm agriculture?
- What factors are most associated with local farm structure?
- What do the identified functional associations portend for local farm structure?

Defining Farm Structure

A guiding principal in choosing an operational definition of small-farm and large-farm areas was complementarity with current Economic Research Service research on the same theme [*15*]. Gross farm product sales of $40,000 or more has been used often in recent years to distinguish between commercial farms and small noncommercial farms [*10*].

We defined *local farm structure* in the following way: For each county in the continental United States, we calculated the percentage of farms with gross sales of less than $40,000 in 1982. This yielded a continuum of percentages that could be reduced to a small number of county groups by setting cutoff points or percentage threshold levels (fig. 1). To make our key analytical model which used multiple discriminant analysis more manageable, we selected cutoff points on the continuum of percentages that would allocate the 3,069 counties into fourths.

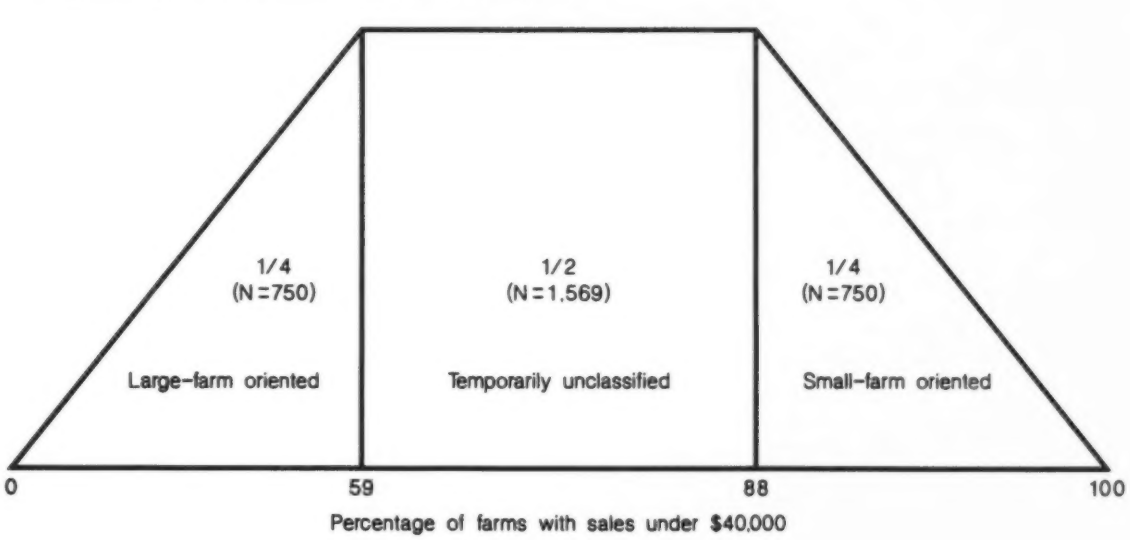
A *small-farm county* was thus defined as a county in which 88 percent or more of farms had 1982 gross sales of less than $40,000. A *large-farm county* was defined as a county in which fewer than 59 percent of farms had 1982 gross sales of less than $40,000.[3] A middle group of 1,569 counties was temporarily unclassified and held aside until later in the analysis.

Profiling Small- and Large-Farm Counties

Small-farm counties are concentrated in eastern Texas with extensions into Louisiana and the Ozarks region and in the Appalachian region. They are also scattered

[3] The exact percentages used in the computer sorting were 88.05 for small-farm counties and 59.27 for large-farm counties. We have rounded the percentages to the nearest whole number for ease of presentation. Six counties containing major cities had no farms in 1982.

Figure 1
Categorizing U.S. counties by farm structure[1,2]



1/ Includes all counties in the continental United States. Counties are arrayed and sorted into quartiles based on percentage of farms which had gross farm sales of less than $40,000 in 1982.
2/ N=3,069 in our classification scheme.

through the Southeast, the upper parts of the Lakes States, and parts of the West (fig. 2). Large-farm counties are heavily concentrated in the northern and southern Great Plains (with eastward extensions into the Corn Belt, lower parts of the Lakes States, and west into Montana) and in the Mississippi River Delta region. They are also scattered through parts of the Eastern and Western United States (fig. 2).

Large-farm counties are less likely to be part of a metro area, and nonmetro large-farm counties are less likely to be adjacent to a metro area (table 1). Greater distance from an urban center affects the options available to farmers in large-farm counties who are striving to adjust to current farm financial stress.

Table 1—Residential areas in which large-farm and small-farm counties are found

Item	Large-farm counties	Small-farm counties	All counties
		Number	
Total counties	750	750	3,069
Residence:			
Metro area[1]	78	202	712
Nonmetro area	672	548	2,357
Adjacent to a metro area[1]	193	240	906
Not adjacent to a metro area	479	308	1,451

[1] Variable was used in the discriminant analysis.

Using data available from secondary sources, we examined the characteristics of small-farm and large-farm counties. We used the 1978 and 1982 *Censuses of Agriculture* to obtain information on key characteristics of the local farming sector, the 1980 *Census of Population* to obtain information on the characteristics of the local population, and Bureau of Economic Analysis, U.S. Department of Commerce, county income and employment data to obtain information on the structure of the local economy. Tables 2–5 present means for selected variables for large-farm and small-farm counties. We also calculated t-scores to help determine whether group means differ significantly from one another.

Farm sector data reflect expected basic differences in farm characteristics between the two county groups (table 2). For example, the average value of land and buildings per farm is about three times greater in the large-farm counties, reflecting the higher proportion of larger commercial farms. Large-farm counties depend less on livestock production, reflecting their concentration in the major U.S. grain belt. The proportion of area in farms for large-farm counties is over twice that of small-farm counties, reflecting in part geographic differences between the two county types. The higher proportion of land in farms in large-farm counties also shows up as higher total farm sales per county. Large-farm counties have more farms per county but, on average, the number of farms increased between 1978 and 1982

Table 2—Selected characteristics of the local farm sector, large-farm counties, and small-farm counties

Item	Unit	Large-farm counties	Small-farm counties	T-value
Counties	Number	750	750	NA
Average:				
Total farms, 1982[1]	do.	786	667	4.12
Farms with sales of —				
less than $40,000	do.	370	620	-11.99
$40,000–$249,999	do.	360	41	31.72
$250,000 or more	do.	55	6	21.22
Change in number of farms, 1978–82[2]	Percent	-5.5	8.0	-24.77
Total farm sales, 1982[2]	1,000 dol.	84,394	11,124	19.19
Livestock sales, 1982[2]	Percent	48.1	62.8	-10.22[3]
Land area in farms, 1982[2]	do.	79.2	35.7	36.67
Value of land and buildings per farm, 1982[2]	Dollars	600,014	202,608	25.50
Operators in 1982:				
Not working off-farm	Percent	56.7	30.5	79.20
Working off-farm:				
1–99 days	do.	13.9	9.0	25.55
100–199 days	do.	7.0	10.9	-27.52
200 or more days	do.	22.4	49.5	-70.63[3]

NA = Not applicable.
[1] Excludes abnormal farms. This category includes institutional farms, experimental and research farms, and Indian reservations.
[2] Variable was used in the discriminant analysis.
[3] T-test based on separate variance estimates because the populations have different variances for that variable.

Sources: *Censuses of Agriculture*, 1978 and 1982.

Figure 2

County farm structure, 1982[1]

Large-farm counties
Unclassified counties tending toward a large-farm structure
Unclassified counties tending toward a small-farm structure
Small-farm counties

1/ See text for definition of county types.

for small-farm counties while farm numbers declined in the large-farm counties.

About half of all U.S. farms with farm sales of $40,000 or more are located in large-farm counties. Thus, any economic conditions or farm policy actions that affect larger farms disproportionately will be felt the most in large-farm counties.

The economic structure of large-farm and small-farm counties differs in major ways (table 3). Large-farm counties have about half the total employment when measured against small-farm counties. Employment growth between 1975 and 1982 (approximately trough to trough in the business cycle) in large-farm counties is about one-third that in small-farm counties. In addition, relatively fewer nonfarm jobs exist in large-farm counties than in small-farm counties. Manufacturing jobs constitute a smaller part of the local economy of large-farm counties. Large-farm counties depend more on farming as a source of income. This greater dependency is reflected in the distribution of labor and proprietor's income according to industry. Farming accounted for 20 percent of 1982 earned income in large-farm counties, compared with less than 5 percent in small-farm counties. Thus, a large-farm community's overall economic performance is more likely to be tied to agriculture than is a small-farm community's. Per capita personal income is significantly higher in large-farm counties, although per capita transfers are significantly lower.

Large-farm counties have had smaller population bases than small-farm counties since 1970 or earlier (table 4). And, they have been characterized by lower population growth since 1970. They are therefore less likely to have participated in the diverse economic changes in nonmetro America over the last 20 years. Large-farm counties have higher per capita total Federal outlays than do small-farm counties. This spending advantage appears to be influenced by per capita agriculture outlays which are 15 times higher in large-farm counties.

The quality of the human capital in the large-farm county population is high as shown by the significantly higher proportion of the 1980 working-age population with a high school education and the significantly lower incidence of disability (table 5). However, large-farm counties do have a significantly higher proportion of

Table 3—Selected characteristics of the local economic structure, large-farm counties, and small-farm counties

Item	Unit	Large-farm counties	Small-farm counties	T-value
Counties	Number	750	750	NA
Average:				
Total employment, 1982	do.	13,947	29,077	-4.17
Nonfarm employment, 1982	do.	12,356	28,179	-4.38
Total 1982 employment—				
Manufacturing industries	do.	2,133	4,818	-4.82
Service-producing industries[1]	do.	5,322	12,368	-3.82
Government	do.	2,389	5,305	-5.26
Total employment, 1975[2]	do.	12,701	23,878	-3.99
Nonfarm employment, 1975	do.	11,005	22,934	-4.28
Total 1975 employment—				
Manufacturing industries	do.	2,107	4,487	-4.69
Service-producing industries[1]	do.	4,429	9,251	-3.59
Government	do.	2,363	4,760	-4.70
Change from 1975-82 in:				
Total employment	Percent	6.1	17.4	-11.28
Nonfarm employment[2]	do.	10.2	20.8	-9.31
Manufacturing employment[2]	do.	23.6	22.7	.23
Service employment[1 2]	do.	12.9	28.1	-12.16
Total labor and proprietor income, 1982	1,000 dol.	210,805	489,349	-3.78
Labor and proprietor income derived from:				
Farming	Percent	21.0	4.3	26.09
Manufacturing industries[2]	do.	15.1	23.5	-10.75
Service-producing industries[1 2]	do	31.0	29.2	3.41
Per capita personal income, 1982[2]	Dollars	9,807	8,261	14.85
Per capita transfer payments, 1982[2]	do.	1,505	1,560	-3.34

NA = Not applicable.
[1]Includes wholesale and retail trade; finance, insurance, and real estate; and personal and business service firms.
[2]Variable was used in the discriminant analysis.

Table 4—Selected characteristics of the local population and public-sector support

Item	Unit	Large-farm counties	Small-farm counties	T-value
Counties	Number	750	750	NA
Average population:				
1984	do.	31,901	67,264	-5.21
1980	do.	30,946	63,152	-5.13
1970	do.	28,268	52,269	-4.44
Counties where population:				
Grew 1970–80, grew 1980–84	Percent	40.4	80.2	-17.27
Declined 1970–80, grew 1980–84[1]	do.	12.7	1.5	8.67
Grew 1970–80, declined 1980–84[1]	do.	20.0	15.9	2.09
Declined 1970–80, declined 1980–84[1]	do.	26.9	2.4	14.31
Rural population, 1980[1]	do.	69.2	66.5	1.91
Population change, 1970–80[1]	do.	4.8	25.6	-19.91
Per capita Federal outlays:				
Total[1]	Dollars	2,830	2,256	6.19
Agriculture[1]	do.	812	55	24.46
Human capital[1]	do.	84	126	-1.47
Economic development[1]	do.	178	182	-.17

NA = Not applicable.
[1]Variable was used in the discriminant analysis.

Table 5—Selected human capital characteristics

Item	Unit	Large-farm counties	Small-farm counties	T-value
Counties	Number	750	750	NA
1980 population:				
Poor[1]	Percent	15.5	17.4	-4.24
65 years old or older[1]	do.	14.2	12.7	7.40
25 years old or older and high school education[1]	do.	63.0	54.2	14.65
16–64 years old and disabled[1]	do.	8.3	11.8	-23.14

NA = Not applicable.
[1] Variable was used in the discriminant analysis.

aged people who are typically heavy consumers of health care services. The relatively higher income levels are reflected in a lower incidence of poverty in the large-farm counties.

Using a Model to Differentiate County Types

We have shown that large-farm and small-farm counties differ in many respects. Yet this information does not suffice to identify which of the variables considered, functioning as a group, best differentiate the two county types. The univariate analytical approach which was taken to arrive at large-farm and small-farm county differences does not take into account the possibility that many of the variables are highly correlated. Thus, a smaller set of key variables may significantly differentiate the county types.

Knowing which variables best differentiate between county types enables researchers to successfully classify counties into groups. Local community leaders can then use that classification scheme to type their own counties. That capability would help them recognize the implications of trends in their areas and identify factors that can be used to shape new directions for their local farm sectors. Planning decisions would necessarily be made in the context of the county population and economic characteristics. The following section elaborates on methodology.

Method of Analysis

We used stepwise discriminant analysis as our primary analytical technique.[4] We used the Statistical Package for the Social Sciences (SPSSX) computer program to make the computations [*20*].

Discriminant analysis permits us to identify those variables most important in differentiating between our two groups of counties. Variables are entered and removed one at a time so that the overall Wilks' lambda is minimized. Discriminant analysis accomplishes this by form-

[4] For a more detailed discussion of discriminant analysis, see [*13*] in the References section.

ing a linear combination of discriminating variables of the form:

$$D = d_1F_1 + d_2F_2 + \ldots\ldots + d_nF_n$$

where D is the score on the discriminant function, the d's are weighting coefficients, and the F's are standardized values of the n discriminating variables included in the analysis. In the two-case approach, the D's can be viewed as scores arrayed along a line. The scores will tend to cluster around two points called centroids. The farther apart the centroids, the better the discriminating function can differentiate between the two types of counties. The weights, or d's, can be interpreted much like regression coefficients: we can identify the variables that contribute most to differentiation along the plane.

We can use the results of the analysis both to identify the precise variables associated with farm structure and to classify counties in the middle. Classifying counties in the middle would enable planners to determine if those counties possess characteristics that tend to move them toward large-farm or small-farm counties.

Variables Considered

Tables 1–5 present the total set of variables originally considered for analysis. Considerably fewer variables were actually included in the model for two reasons. If two or more variables were highly correlated, only one could be used in the model because of the technique's mathematical properties. The variables which tended to be the most highly correlated were the set related to economic structure. For example, total employment in 1982 was highly correlated with total employment in 1975, nonfarm employment in 1982 and 1975, and 1982 labor and proprietor income from manufacturing and services. Thus, the number of variables pertaining to economic structure actually used in the analysis was markedly smaller than the original set.

To simplify the use of geographic variables in our analysis, we divided the United States into five regions using a county classification system reported by Beale and Fuguitt (fig. 3).[7] Large-farm counties are distributed among the five regions in a distinctly different pattern from that of small-farm counties (table 6). For example, 69 percent of the large-farm counties are located in the Central U.S. Agriculture region, compared with only 4 percent of the small-farm counties. As we point out later, the uneven distribution has important implications for public efforts to alter Federal farm programs.

Results of Discriminant Analysis

The discriminant function differentiated between large-farm and small-farm counties quite well as both the difference in the group centroids and the relatively high canonical correlation suggest (table 7).[8] In our analysis, we adopted the convention of splitting the counties in each group in half using randomized procedures, developing the function using one-half the group, and then testing the model using the other half. Over 96 percent of the counties included in the analysis were correctly classified using the discriminant function. A similar proportion of the counties not included in the original analysis was also correctly classified using the discriminant function. This result further testifies to the strength of the discriminant function.

The variables significant in discriminating between large-farm and small-farm counties included not only farm-related variables, but also variables denoting location, economic structure, human capital, and population. This result is consistent with our hypothesis.

Variables loading in favor of large-farm counties include:

* having a relatively high value of land and buildings per farm,
* having a high total farm sales per county,
* having a high percentage of land in farms, and
* having a high proportion of county-earned income from farming.

This result supports the earlier univariate analysis finding that large-farm counties have a less diverse economy than do small-farm counties.

[7] For a fuller discussion, see Appendix A.

[8] We examined two additional discriminant functions which are discussed in Appendix B.

Table 6—Regions in which large-farm and small-farm counties are found

Item	Large-farm counties	Small-farm counties	All counties
		Number	
Total counties	750	750	3,069
Region:			
Urban Northeast[1]	104	45	525
Eastern Mountains and Uplands[1]	6	402	697
Southeastern Coastal Plains[1]	55	180	547
Central U.S. Agriculture	517	31	900
West[1]	68	92	400

[1] Variable was used in the discriminant analysis.

Figure 3

Subregions used in farm structure analysis

Table 7—Results of discriminant analysis

Item	Standardized function coefficients	County means[1]	
		Large-farm	Small-farm
		Number	
Total counties	1,500	750	750
Counties in analysis	750	381	369
Farm-related variables:		*Dollars*	
Value land and buildings per farm, 1982	-.31	586,278	198,774
Total farm sales, 1982	-.30	97,684	10,725
		Percent	
Percent land area in farms, 1982	-.16	79.6	35.7
Percent change in number of farms, 1978-82	.54	-5.8	7.7
Percent livestock sales, 1982	.15	48.0	62.0
Location variables:			
Urban Northeast		13.6	6.0
Eastern Mountains and Uplands	.72	1.1	51.7
Southern Coastal Plains	.51	7.9	25.2
West	.20	8.7	12.4
Metro, 1983		10.0	29.5
Nonmetro adjacent to a metro area, 1983		27.6	29.8
Human capital variables:			
Percent 1980 population 65+ years old	.11	14.3	12.7
Percent 1980 population disabled	.22	8.3	11.8
Percent 1980 population 25+ years with high school education		62.4	54.3
Percent 1980 population poor		15.8	17.3
Economic structure variables:		*Number*	
Total employment, 1982	.20	10,811	24,770
Percent employment change, 1975-82—		*Percent*	
Total nonfarm		10.2	21.0
Manufacturing		21.1	24.7
Services		12.3	28.4
		Dollars	
Per capita income, 1982		9,704	8,180
Percent earned income, 1982—		*Percent*	
Farming	-.26	20.9	4.2
Manufacturing		14.7	23.6
Services		31.3	29.2
		Dollars	
Per capita transfer payments, 1982		1,504	1,550
Population and public sector:		*Percent*	
Percent population change, 1970-80	.19	4.2	26.3
1970-80, 1980-84 population change—			
Grew 1970-80, declined 1980-84		12.9	19.0
Declined 1970-80, grew 1980-84		17.8	14.4
Declined 1970-80, declined 1980-84		29.1	3.0
Percent rural population, 1980		70.0	66.5
Per capita Federal outlays—		*Dollars*	
Total		2,847	2,136
Agriculture		826	55
Human capital		66	99
Economic development		167	196
		Unit	
Group centroids		-2.00	2.07
Canonical correlation	.90		
Wilks' lambda	.19		

[1] The means apply only to those counties used in the analysis.

Variables loading in favor of small-farm counties include:

* having a relatively high percentage change in the number of farms*,
* having a higher proportion of farm sales from livestock products,
* being in the eastern Mountain and Upland regions, southern Coastal Plains, and West relative to the Central U.S. Agriculture region,
* having a higher total employment base,
* having higher population growth, and
* having higher aged and disabled populations.

Small-farm counties are characterized by a larger and more diverse economic base.

Categorizing the Unclassified Counties

The discriminant function was developed using the top and bottom quartile of counties arrayed by proportion of total farms with 1982 gross farm sales of less than $40,000. This leaves 1,563 counties, approximately the middle half, unclassified.[10] Our analysis suggests that large-farm structure in a county is associated with a county typology featuring a relatively small nonfarm economic base and slow population growth or population decline. Some of the unclassified counties have characteristics which portend a drift toward a large-farm county structure. Identifying which direction unclassified counties might go enables local policymakers and private-sector entrepreneurs considering tradeoffs between farm and nonfarm economic development options to make informed decisions.

The first step in classifying counties was to generate classification functions for the model presented in table 7. The overall function scores for each county were then generated, using classification functions and variables previously identified as being best able to discriminate between large- and small-farm counties. All counties were then denoted as large-farm oriented or small-farm oriented.

Results show that the model correctly classified 728 of the original large-farm counties and 717 of the original small-farm counties (table 8). The model grouped 740 of the 1,563 unclassified counties into the large-farm category and 823 into the small-farm category. We have summarized the results of the county classification by State (table 9).

Unclassified counties possessing characteristics that lean toward small-farm structure are concentrated in New England, the Southeast, and the West (see fig. 2). They typically lie adjacent to small-farm counties. Farm structure in these unclassified counties will probably gravitate toward that of the small-farm counties, and local community and farm leaders will likely focus on finding a niche for farming in a basically nonfarm economy.

Unclassified counties possessing characteristics that portend large-farm structure are concentrated in areas adjacent to large-farm counties in the Central U.S. Agriculture and Urban Northeast regions (see fig. 2). Community leaders in the unclassified counties tending toward large-farm counties will likely face difficult decisions about the role of farming in their communities. They may need to take steps to increase nonfarm employment growth, perhaps at some loss to the farming sector. Policy options might range from making land use decisions that favor more urban development to setting up transportation programs to ease commutes to nonfarm jobs outside the area. Regardless of the solutions being considered, tensions between farm and nonfarm constituencies are likely to be higher in these counties.

Implications for Rural America

The structure of the local farming sector is influenced not only by conditions within that sector but also by conditions in the nonfarm sector. Analysis presented here suggests which factors are likely to be associated with the changing farm structure. The local driving forces considered include the local farming sector, community economic structure, geography, human capital, and population size and the public sector.

These forces will tend to push some county economies toward specialization in farming, possibly with only a few super farms remaining. Farming counties dominated by super farms imply an intent to compete on a global basis. Counties may alternatively shift increasingly toward a diversified economic base which includes farming, but is not dependent upon it. The analytical approach used in this report is designed to identify three groups of counties (measured by the proportion of small farms they contain) and to set up a procedure to assess which way the middle group will shift. Thus, counties on the verge of major economic change will be able to

* Because most counties lost farms between 1978–82, this variable can also be interpreted to mean that the decline in the number of farms was relatively small.

[10] Six counties containing major cities had no farms in 1982.

anticipate if they are becoming large-farm counties or small-farm counties.

Large-Farm Region. This region includes the Northern Great Plains, Southern Great Plains, western part of the Corn Belt, and Mississippi River Delta (see fig. 2). This is the same area where local economies are dominated by farming [*3*]. The vast plains portion is characterized by a very low population density, specialization in grain farming, and a culture of affluence as evidenced by high per capita income.

Global competitive pressures and output-increasing technology will move the agricultural sector of the Great Plains toward greater consolidation of farms, releasing farm labor to the nonfarm job market. Nonfarm jobs are lacking in many farm communities, suggesting that farmers will have to migrate. Some will move intraregionally to magnet counties with diversified economies healthy enough to maintain basic public services such as health care and transportation. Others may relocate to medium-to-large metro areas at the periphery of the Great Plains. This migration likely will be selective, with the younger, better educated residents moving first and furthest. It is in these areas that land prices have declined the most recently due to increased uncertainty about farm profits. Lower land prices will result in a reduced flow of tax revenues to local and State governments. Also, there has been discussion about lowering per farmer payment limits on Federal farm commodity programs. Because this region is dominated by large-farm agriculture and because the crop mix includes most commodities covered by Federal farm programs, this region will likely be affected the most by such limitations if enacted.

Public pressure is being exerted on all levels of government to maintain a high enough level of public and private services to keep the giant region from continuing to decline economically. We anticipate that community leaders will be evaluating whether or not their farming sector has enough advantage to emerge as global victors among farm sector competitors. Some will want to follow a strategy designed to build a diversified economy. Establishing a knowledge base of their resources and of how those resources mesh with the broader economy will be important to this decisionmaking process.

Unclassified Region. This region is composed of broad bands of counties located throughout the United States. They are typically buffer or hybrid areas lying between concentrated areas of large-farm and small-farm counties. They have more control over their economic destiny, compared with large-farm counties. Community leaders of the unclassified counties will need to know how much their blend of resources predisposes them to become either large-farm or small-farm counties. Community leaders can then be actively involved in influencing changes at the local level.

Our discriminant analysis provides some benchmarks for making this determination. For example, data in table 9 show that Alabama, with 67 counties, had none categorized as large-farm counties, 21 categorized as small-farm counties, and 46 unclassified. Of the 46 unclassified counties, 3 tend to be large-farm counties and 43 tend to be small-farm counties according to the patterns of variables identified by the discriminant function. Because most unclassified counties tend toward small-farm agriculture, Alabama State and local officials may wish to give more attention to nonfarm options as a way to strengthen rural economies.

Small-Farm Region. This region is located primarily in the Southeast. Its diversified farming system will act to insulate its farm economy from the effect of global competition. In fact, reduced feed grain prices will lower costs for its livestock, poultry, and fish producers. The trend toward increased poultry consumption will benefit large poultry producing areas such as Georgia and Virginia and the Ozark mountain sections of Arkansas, Missouri, and Oklahoma. The region is probably best characterized by its medium-sized metro centers which offer extensive blends of goods and services. These centers are easily reached by most farm families. Such proximity to nonfarm employment opportunities will foster part-time farming with the cash flow eased by off-farm paychecks. It will also promote competition for labor with existing larger farms in the region. However, an offsetting factor is that the region's nonfarm jobs, especially those in shoe, clothing, and textile manufacturing, are experiencing strong competitive pressures from foreign exporters. Thus, nonfarm industries in small-farm counties are not necessarily immune from the effects of strong competitors in an increasingly interdependent world economy.

Table 8—Allocating 3,063 U.S. counties into large-farm and small-farm categories using the discriminant function

County definitions	Classified by discriminant functions as being a —				Total
	Large-farm county		Small-farm county		
	Number	*Percent*	*Number*	*Percent*	*Number*
Large-farm	728	97	22	3	750
Unclassified	740	47	823	53	1,563
Small-farm	33	4	717	96	750
Total	1,501	49	1,562	51	3,063

Table 9—County categorization by State[1]

State	Counties					
	Total	Large-farm	Small-farm	Unclassified	Unclassified leaning toward[2]—	
					Large-farm structure	Small-farm structure
				Number		
Alabama	67	0	21	46	4	42
Arkansas	75	15	18	42	6	36
Arizona	14	2	2	10	6	4
California	58	11	9	38	15	23
Colorado	63	16	10	37	16	21
Connecticut	8	0	0	8	1	7
Delaware	3	1	0	2	1	1
Florida	67	3	13	51	7	44
Georgia	159	24	43	92	9	83
Iowa	99	82	0	17	17	0
Idaho	44	18	3	23	10	13
Illinois	102	60	3	39	28	11
Indiana	92	17	12	63	52	11
Kansas	105	45	2	58	57	1
Kentucky	120	1	69	50	1	49
Louisiana	64	10	19	35	18	17
Massachusetts	14	1	1	12	0	12
Maryland	23	8	3	12	5	7
Maine	16	1	3	12	1	11
Michigan	83	2	17	64	44	20
Minnesota	87	47	8	32	26	6
Missouri	114	6	28	80	59	21
Mississippi	82	10	31	41	4	37
Montana	56	32	4	20	12	8
North Carolina	100	19	26	55	19	36
North Dakota	53	36	0	17	17	0
Nebraska	93	83	0	10	10	0
New Hampshire	10	0	1	9	0	9
New Jersey	20	0	0	20	12	8
New Mexico	32	4	12	16	8	8
Nevada	17	4	4	9	2	7
New York	60	18	3	39	24	15
Ohio	88	5	20	63	43	20
Oklahoma	77	5	36	36	27	9
Oregon	36	6	9	21	3	18
Pennsylvania	67	6	8	53	19	34
Rhode Island	5	0	1	4	2	2
South Carolina	46	1	21	24	9	15
South Dakota	66	54	0	12	11	1
Tennessee	95	1	70	24	2	22
Texas	254	35	110	109	82	27
Utah	29	1	8	20	4	16
Virginia	98	6	41	51	3	48
Vermont	14	6	0	8	0	8
Washington	39	9	13	17	2	15
Wisconsin	71	36	0	35	29	6
West Virginia	55	0	48	7	0	7
Wyoming	23	3	0	20	13	7
Total	3,063	750	750	1,563	740	823

[1] County categorization was based on the percent of total farms with 1982 gross farm sales of less than $40,000.
[2] This determination was made using the classification function obtained from the discriminant analysis.

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Appendix A—Developing Subregions

Subregions used for this study were derived from those developed by Fuguitt and Beale [8]. Their subregions reflect rather homogeneous combinations of counties having similar economic activity, history, physical setting, settlement patterns, and culture (app. fig. 1). Fuguitt and Beale developed these areas for use primarily in demographic studies. However, the subregions had intuitive appeal as independent variables for our study of farm structure.

Geography affects the type of farming in a region through such factors as terrain, rainfall, and soil quality. The Northern Appalachian Coal Fields, for example, are much less conducive to large-scale crop farming than are other regions.

Settlement patterns affect the set of options a farm family has for dividing its labor between farm and nonfarm activities. For example, farm families living in the Northeast Metropolitan Belt are more likely to have better access to nonfarm jobs than those living in the Northern Great Plains. Thus, the opportunity cost of labor is much higher in the Northeast.

Nonfarm industry in a region also affects farmland values. Recent declines in farmland values have been less severe in the Lower Great Lakes Industrial area than further west.

Some combination of the Fuguitt and Beale subregions also appeared to be superior to other regional delineations such as the Census Bureau's divisions or USDA's farm production regions. For example, the Mississippi Delta farm production region contains Mississippi, Louisiana, and Arkansas. Yet the true Mississippi Delta contains only a small band of counties adjacent to the Mississippi river. Other areas of Arkansas, for example, are mountainous and unsuited to large-scale agriculture. Regions designated by Fuguitt and Beale differentiate between the true Delta and the Ozark-Ouachita mountains further west.

We were unable to use the original Fuguitt and Beale regions for our analysis. Our unit of observation is the county and the dependent variable is a function of the proportion of farms with sales under $40,000. Some regions had few counties of any one type. For example, the Ozark-Ouachita subregion had no counties with fewer than 58 percent of farms with sales under $40,000. Other regions had similar distributions of counties across our county types. These factors suggested to us that some regional aggregation was appropriate.

We used the following regions in our analysis (app. fig. 2):

Urban Northeast. This area is dominated by the contiguous metropolitan areas stretching from Boston to Washington, DC, and the manufacturing and metropolitan belt that extends from Albany, New York, to Milwaukee, Wisconsin, along the southern shores of the Great Lakes. We also included Northern New England, the Upper Great Lakes, and the Dairy Belt. This broad region contains 525 counties and 422,565 farms. About two-thirds of the farms reported sales of less than $40,000 in 1982. Over 89 million people lived in the area in 1984, making it the most populous region of the five.

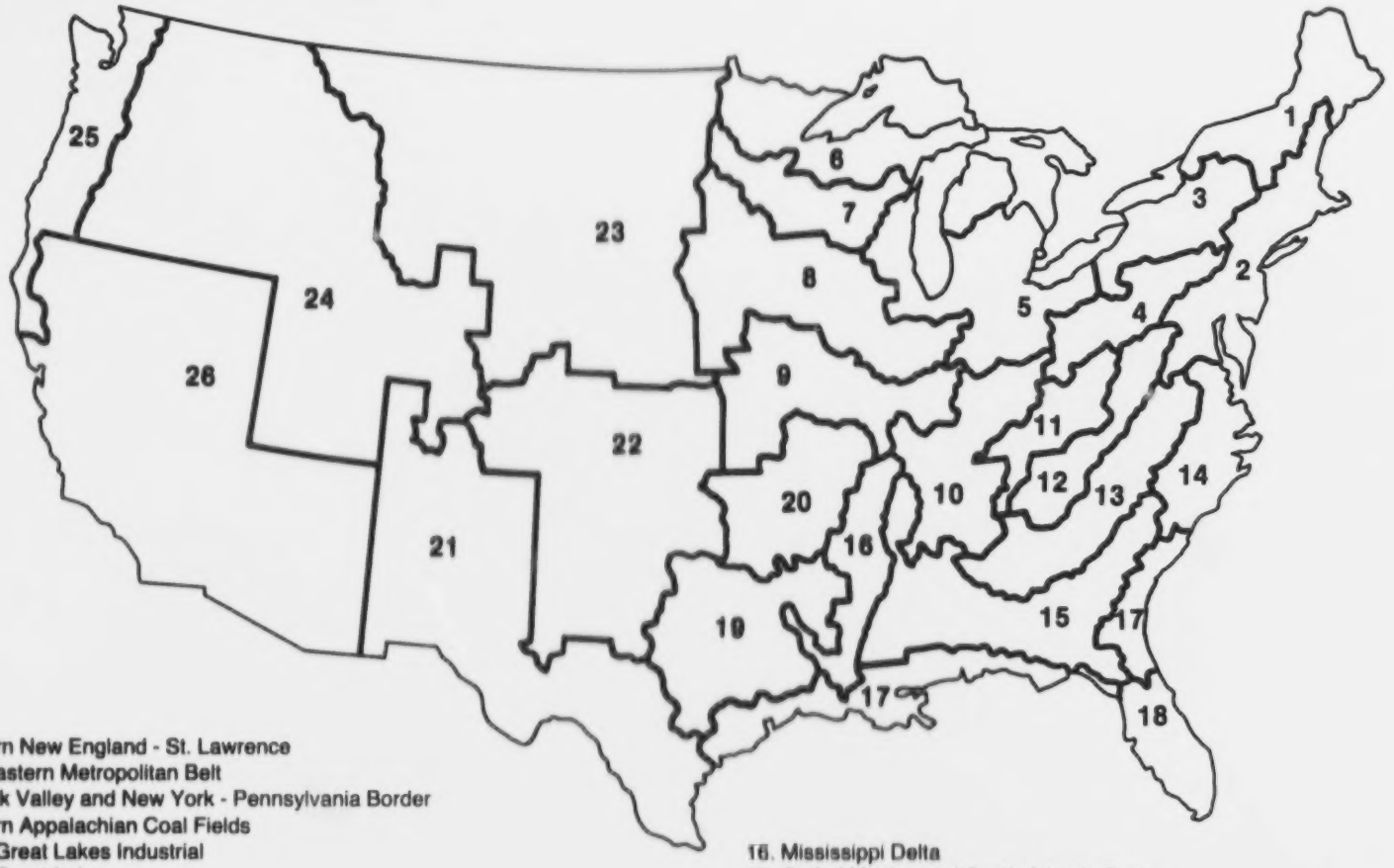
Eastern Mountains and Uplands. This area includes the Northern and Southern Appalachian Coal Fields; the Blue Ridge, Great Smokies, and Great Valley areas of the Southern Appalachians; the Southern Piedmont; the Southern Interior Uplands lying between the Ohio and Tennessee Rivers; and the Ozark-Ouachita Uplands. This area generally contains major pockets of rural poverty, has historically been dominated by small-farm agriculture, and has the textile industry as an important part of the manufacturing economy. There are 697 counties and 515,069 farms in the area. Over 87 percent of the farms reported sales under $40,000 in 1982. This is the largest incidence of small farms among the regions we defined. About 35 million people lived in the area in 1984.

Southeast Coastal Plains. This area includes the Southern Coastal Plains from Virginia to the Mississippi Delta; Florida and the low-lying coastal areas from Charleston, South Carolina, to Houston, Texas; and the East Texas Coastal Plain. It includes the old southern Cotton Belt and peanut and tobacco farming areas; areas with a large rural black population; and resorts, retirement, and the semitropical agriculture of Florida and Texas. The area still contains several counties characterized by large-farm agriculture. It included 547 counties and 329,842 farms as of 1982. About 80 percent of the farms had sales of less than $40,000 in 1982. About 38 million people lived in the area in 1984.

Central U.S. Agriculture. This region contains the major U.S. agricultural producing areas. It covers the Mississippi Delta counties, the Corn Belt from Central Indiana to eastern Nebraska and Kansas, and the Plains counties from Texas to Canada. It has 900 counties and 697,355 farms. Fewer than 60 percent of the farms reported sales under $40,000 in 1982, making it the region with the highest concentration of large farms among the five regions. It is also the least populated region with about 27 million people in 1984.

Appendix figure 1

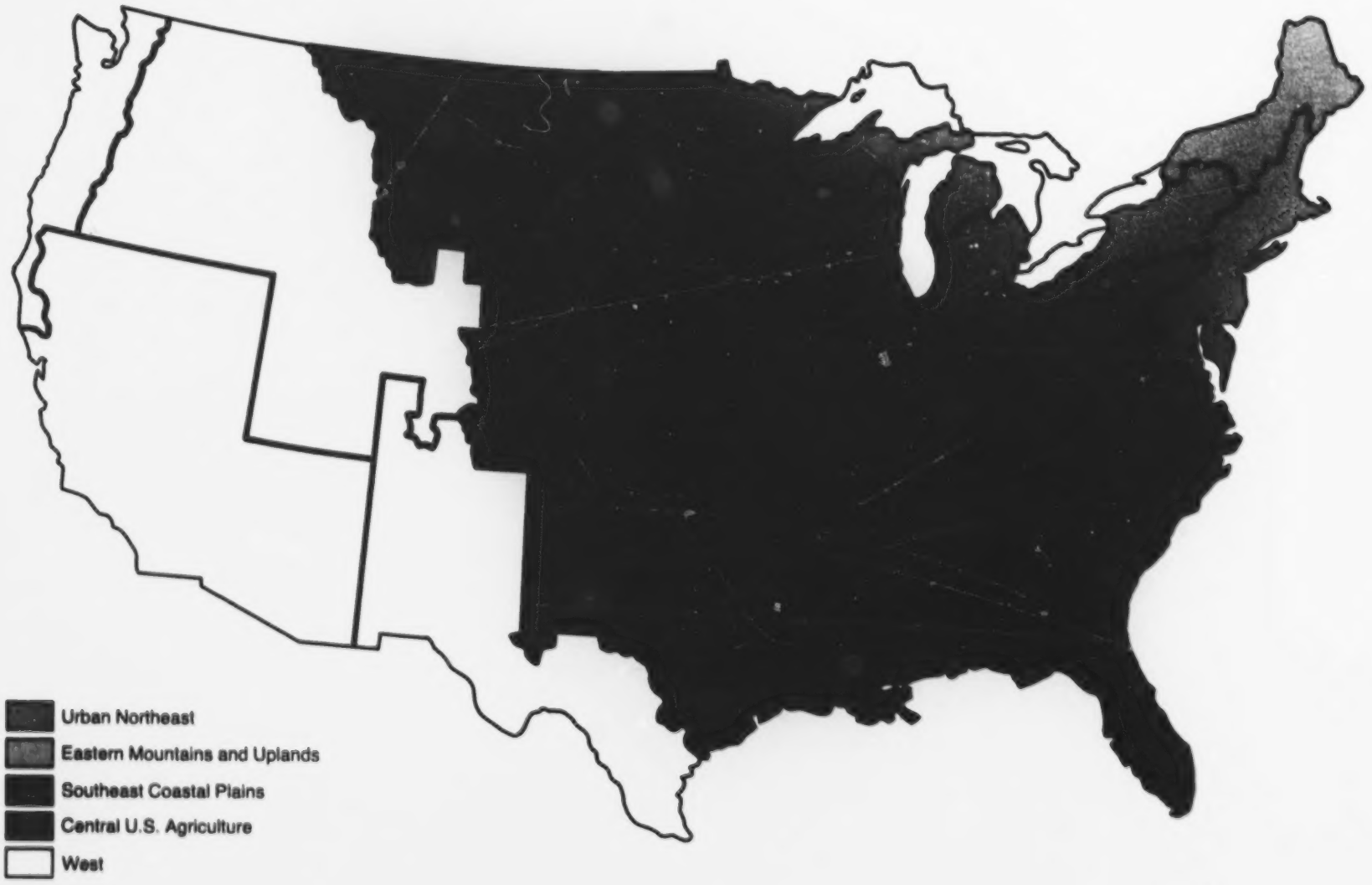
Original subregions of the United States



1. Northern New England - St. Lawrence
2. Northeastern Metropolitan Belt
3. Mohawk Valley and New York - Pennsylvania Border
4. Northern Appalachian Coal Fields
5. Lower Great Lakes Industrial
6. Upper Great Lakes
7. Dairy Belt
8. Central Corn Belt
9. Southern Corn Belt
10. Southern Interior Uplands
11. Southern Appalachian Coal Fields
12. Blue Ridge, Great Smokies, and Great Valley
13. Southern Piedmont
14. Coastal Plain Tobacco and Peanut Belt
15. Old Coastal Plain Cotton Belt
16. Mississippi Delta
17. Gulf of Mexico and South Atlantic Coast
18. Florida Peninsula
19. East Texas and Adjoining Coastal Plain
20. Ozark-Ouachita Uplands
21. Rio Grande
22. Southern Great Plains
23. Northern Great Plains
24. Rocky Mountains, Mormon Valleys, and Columbia Basin
25. North Pacific Coast (including Alaska)
26. The Southwest (including Hawaii)

Appendix figure 2

Subregions used in farm structure analysis



West. This region contains the sparsely settled Rio Grande valley from south Texas up to Colorado; the Rocky Mountains, Mormon Valleys, and Columbia Basin where irrigated agriculture is important; the Southwest; and the Pacific Northwest. The region has 400 counties, the smallest number of counties in any region. Only 269,890 farms were in the area in 1982, three-fourths of which reported sales under $40,000. The region has extensive Federal lands and, with some exception, limited agricultural potential. In 1984, about 46 million people lived in the area.

Appendix B—Alternative Discriminant Models

Selection of variables was discussed regularly throughout the course of our research. We tended to focus our attention on two groups of variables, farm related and location. We asked ourselves, "What would happen if we deleted farm-related and location variables?" We therefore reran the discriminant function models with these variables deleted. The results appear in appendix tables 1 and 2.

Deleting the farm-related variables caused a modest drop in separation of group centroids (-1.53 versus 1.58) compared with the initial model whose groups centroids were -2.00 versus 2.07. But, the main result of the deletion was that the human capital variables made a robust appearance in behalf of the small-farm counties.

Deleting the group of location variables constructed from the Fuguitt and Beale regions resulted in a slight drop in the separation of group centroids to -1.86 versus 1.80 from -2.00 versus 2.07. The coefficients for the farm-related variables tended to increase in behalf of the large-farm counties. One human capital variable, percent of 1980 population aged 25 and over with at least a high school education, maintained its appearance in behalf of the large-farm counties. But, in the model with farm-related variables deleted, the education variable appeared in behalf of small-farm counties.

Appendix table 1—Results of discriminant analysis that excluded farm-related variables

Item	Standardized function coefficients	County means[1]	
		Large-farm	Small-farm
		Number	
Total counties	1,500	750	750
Counties in analysis	750	381	369
		Dollars	
Farm-related variables:			
Value land and buildings per farm, 1982	NA	586,278	198,774
Total farm sales, 1982	NA	97,684	10,725
		Percent	
Percent land area in farms, 1982	NA	79.6	35.7
Percent change in number of farms, 1978–82	NA	-5.8	7.7
Percent livestock sales, 1982	NA	48.0	62.0
Location variables:			
Urban Northeast		13.6	6.0
Eastern Mountains and Uplands	.96	1.1	51.7
Southern Coastal Plains	.62	7.9	25.2
West	.30	8.7	12.4
Metro, 1983	.15	10.0	29.5
Nonmetro adjacent to a metro area, 1983		27.6	29.8
Human capital variables:			
Percent 1980 population 65 + years old	.35	14.3	12.7
Percent 1980 population disabled	.29	8.3	11.8
Percent 1980 population 25 + years with high school education	.29	62.4	54.3
Percent 1980 population poor	.16	15.8	17.3
		Number	
Economic structure variables:			
Total employment, 1982	.24	10,811	24,770
		Percent	
Percent employment change, 1975–82—			
Total nonfarm		10.2	21.0
Manufacturing		21.1	24.7
Services	.20	12.3	28.4
		Dollars	
Per capita income, 1982		9,704	8,180
		Percent	
Percent earned income, 1982—			
Farming	-.50	20.9	4.2
Manufacturing	-.15	14.7	23.6
Services	-.31	31.3	29.2
		Dollars	
Per capita transfer payments, 1982		1,504	1,550
		Percent	
Population and public sector:			
Percent population change, 1970–80	.27	4.2	26.3
1970–80, 1980–84 population change—			
Grew 1970–80, declined 1980–84		12.9	19.0
Declined 1970–80, grew 1980–84		17.8	14.4
Declined 1970–80, declined 1980–84		29.1	3.0
Percent rural population, 1980		70.0	66.5
		Dollars	
Per capita Federal outlays—			
Total		2,847	2,136
Agriculture	-.14	826	55
Human capital		66	99
Economic development		167	196
		Unit	
Group centroids		-1.53	1.58
Canonical correlation	.84		
Wilks' lambda	.29		

NA = Not applicable.
[1] The means apply only to those counties used in the analysis.

Appendix table 2—Results of discriminant analysis that excluded location variables

Item	Standardized function coefficients	County means[1]	
		Large-farm	Small-farm
		Number	
Total counties	1,500	750	750
Counties in analysis	750	381	369
		Dollars	
Farm-related variables:			
Value land and buildings per farm, 1982	.39	586,278	198,774
Total farm sales, 1982	.35	97,684	10,725
		Percent	
Percent land area in farms, 1982	.26	79.6	35.7
Percent change in number of farms, 1978–82	-.54	-5.8	7.7
Percent livestock sales, 1982	-.20	48.0	62.0
Location variables:			
Urban Northeast	NA	13.6	6.0
Eastern Mountains and Uplands	NA	1.1	51.7
Southern Coastal Plains	NA	7.9	25.2
West	NA	8.7	12.4
Metro, 1983		10.0	29.5
Nonmetro adjacent to a metro area, 1983		27.6	29.8
Human capital variables:			
Percent 1980 population 65+ years old		14.3	12.7
Percent 1980 population disabled	-.29	8.3	11.8
Percent 1980 population 25+ years with high school education	.34	62.4	54.3
Percent 1980 population poor		15.8	17.3
		Number	
Economic structure variables:			
Total employment, 1982	-.19	10,811	24,770
		Percent	
Percent employment change, 1975–82—			
Total nonfarm		10.2	21.0
Manufacturing		21.1	24.7
Services		12.3	28.4
		Dollars	
Per capita income, 1982		9,704	8,180
		Percent	
Percent earned income, 1982—			
Farming	.27	20.9	4.2
Manufacturing		14.7	23.6
Services	.15	31.3	29.2
		Dollars	
Per capita transfer payments, 1982		1,504	1,550
		Percent	
Population and public sector:			
Percent population change, 1970–80	-.29	4.2	26.3
1970–80, 1980–84 population change—			
Grew 1970–80, declined 1980–84		12.9	19.0
Declined 1970–80, grew 1980–84		17.8	14.4
Declined 1970–80, declined 1980–84		29.1	3.0
Percent rural population, 1980	.14	70.0	66.5
		Dollars	
Per capita Federal outlays—			
Total		2,847	2,136
Agriculture		826	55
Human capital		66	99
Economic development		167	196
		Unit	
Group centroids		1.80	-1.86
Canonical correlation	.88		
Wilks' lambda	.23		

NA = Not applicable.
[1] The means apply only to those counties used in the analysis.

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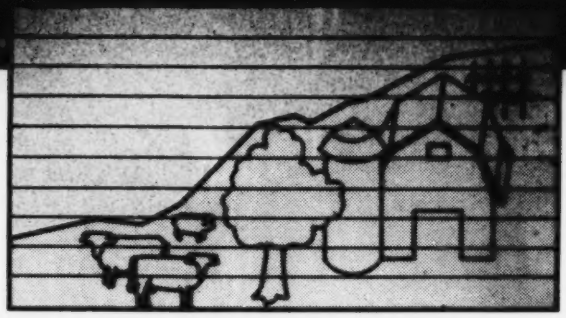

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